

Design and Development of an Efficient MIMO OFDM Co-design



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Abstract:

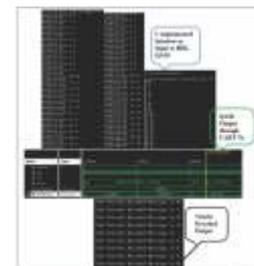
In recent times, the integration of Orthogonal Frequency Division Multiplexing (OFDM) technique with Multiple Input Multiple Output (MIMO) systems has been an area of interesting and challenging research in the field of broadband wireless communication. The OFDM MIMO systems are either fully implemented on reconfigurable computing, MATLAB coded or software implemented. Thus, the design and development of efficient MIMO OFDM hardware software Co-design will improve the system performance.

In this project, an OFDM MIMO Co-design that implements the OFDM system modules in C and the programmable QAM module implemented in HDL on FPGA is presented. In order to fulfill the hardware software interface, a UART transmitter module is also designed and developed and HDL-FPGA implemented. Performance analysis by profiling and optimization of the system implemented in C has been carried out using Real View Development Suite (RVDS) by considering different ARM cores namely, ARM 1136, ARM926 and ARM Cortex A8. Binary data input was used to analyze the system performance. The resource utilization for the programmable QAM module is analyzed and device best suited for implementation is narrowed down on.

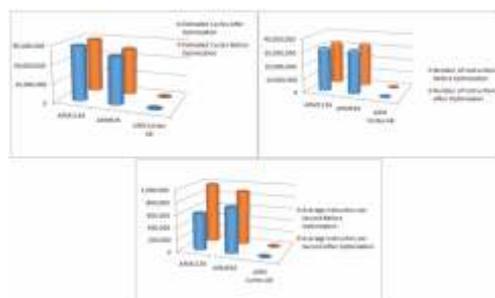
Appropriate test strategy is followed and test cases are developed for verifying the test results. Based on the test results and functional requirements, the MIMO OFDM Co-design system has been validated. The performance of the system is compared and analyzed by profiling in RVDS on different ARM cores. ARM Cortex A8 gives better performance in terms of number of cycles estimated to execution of code and code coverage when compared with lower versions of ARM cores. The performance of the Co-design system can be improved by porting the design on real time operating system.



MIMO OFDM co-design



MIMO OFDM co-design system result



MIMO OFDM co-design performance analysis on ARM cores